IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. : 09/618,741 Applicant : Thomas M. Hartnett et al. Filed : July 18, 2000 T.C./A.U. : 1731 Examiner : John M. Hoffmann Docket No. : RTN2-118PUS (formerly 07206-118001)	Confirmation No. : 8640

LETTER AND REPLACEMENT APPENDIX

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In reviewing the file today it was noticed that the claim status of claim 33 in the Appendix was inadvertently omitted. Attached hereto is a replacement appendix with the status of claim 33 corrected.

Respectfully submitted,
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Date

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REPLACEMENT APPENDIX
CLAIMS

Claim 32. (rejected) A method of making aluminum oxynitride, the method comprising:

(a) providing a chamber; **{page 4, lines 12-19}**

(b) introducing aluminum oxide particles and carbon particles into the provided chamber; **{page 5, lines 2-24}**

(c) reacting the aluminum oxide particles and carbon particles introduced into the provided chamber with nitrogen, comprising: **{page 5, lines 24-page 6, line 10}**

mixing the aluminum oxide particles and carbon particles within the provided chamber; **{page 5, lines 24-page 6, line 10}**

passing nitrogen gas over the mixing aluminum oxide particles and carbon particles with the mixing aluminum oxide particles and carbon particles being at a temperature sufficient to convert the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride during the conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride**{page 5, lines 24-page 6, line 10}**; and

(d) removing the aluminum oxynitride from the chamber **{Page 6, lines 10-12}**.

Claim 33. (rejected) The method recited in claim 32 wherein the temperature is in a range of about 1700-1900°C. **{page 5, lines 5-12}**

Claim 34. (rejected) A method of making aluminum oxynitride, the method comprising:

(a) providing a chamber; **{page 4, lines 12-19**

(b) introducing aluminum oxide particles and carbon particles into the provided chamber; **{page 5, lines 2-24}**

(c) reacting the aluminum oxide particles and carbon particles introduced into the provided chamber with nitrogen, comprising: **{page 5, lines 24-page 6, line 10}**

mixing the aluminum oxide particles and carbon particles within the provided chamber; **{page 5, lines 24-page 6, line 10}**

passing nitrogen gas over the mixing aluminum oxide particles and carbon particles with the mixing aluminum oxide particles and carbon particles being at a temperature

maintained constant during conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride; **{page 5, lines 24-page 6, line 10}**and

(d) removing the aluminum oxynitride from the chamber. **{Page 6, lines 10-12}**

Claim 35. (rejected) The method recited in claim 34 wherein the temperature is in a range of about 1700-1900°C. **{page 5, lines 5-12}**

Claim 36. (rejected) A method of making aluminum oxynitride, the method comprising:

(a) providing a chamber; **{page 4, lines 12-19**

(b) introducing aluminum oxide particles and carbon particles into the provided chamber; **{page 5, lines 2-24}**

(c) reacting aluminum oxide particles and carbon particles introduced into the provided chamber with nitrogen, comprising: **{page 5, lines 24-page 6, line 10}**

mixing the aluminum oxide particles and carbon particles within the provided chamber; **{page 5, lines 24-page 6, line 10}**

passing nitrogen gas over the mixing aluminum oxide particles and carbon particles; **{page 5, lines 24-page 6, line 10}**

mixing the aluminum oxide particles and carbon particles with the nitrogen gas passing over the mixing aluminum oxide particles and carbon particles with the mixing aluminum oxide particles and carbon particles being at a constant temperature during conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride; **{page 5, lines 24-page 6, line 10}**and

(d) continuously removing the aluminum oxynitride from the chamber. **{page 7, lines 22-page 8, line 20}**

Claim 37. (rejected) The method recited in claim 36 wherein the temperature is in a range of about 1700-1900°C. **{page 5, lines 5-12}**

Claim 38. (rejected) A method of making aluminum oxynitride, the method comprising:

(a) providing a chamber; **{page 4, lines 12-19**

(b) introducing aluminum oxide particles and carbon particles into the provided chamber; **{page 5, lines 2-24}**

(c) reacting the aluminum oxide particles and carbon particles introduced into the provided chamber with nitrogen, comprising: **{page 5, lines 24-page 6, line 10}**

mixing the aluminum oxide particles and carbon particles within the provided chamber; **{page 5, lines 24-page 6, line 10}**

passing nitrogen gas over the mixing aluminum oxide particles and carbon particles with the chamber; **{page 5, lines 24-page 6, line 10}** and

providing a temperature in a range of about 1700-1900°C during conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride; **{page 5, lines 24-page 6, line 10}**and

(d) removing the aluminum oxynitride from the chamber. **{Page 6, lines 10-12}**

Claim 39. (rejected) A method of making aluminum oxynitride, the method comprising:

(a) providing a chamber; **{page 4, lines 12-19**

(b) introducing aluminum oxide particles and carbon particles into the provided chamber; **{page 5, lines 2-24}**

(c) reacting the aluminum oxide particles and carbon particles introduced into the provided chamber with nitrogen, comprising: **{page 5, lines 24-page 6, line 10}**

mixing the aluminum oxide particles and carbon particles within the provided chamber; **{page 5, lines 24-page 6, line 10}**

passing nitrogen gas over the mixing aluminum oxide particles and carbon particles; **{page 5, lines 24-page 6, line 10}**

having the mixing aluminum oxide particles and carbon particles with the nitrogen gas passing over the mixing aluminum oxide particles and carbon particles at a temperature selected to convert the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride during the conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride; **{page 5, lines 24-page 6, line 10}** and

(d) removing the aluminum oxynitride from the chamber. **{Page 6, lines 10-12}**

Claim 40. (rejected) The method recited in claim 39 wherein the temperature of the chamber is in a range of about 1700-1900°C. **{page 5, lines 5-12}**

Claim 41. (rejected) A method of making aluminum oxynitride, the method comprising:

(a) providing a chamber; **{page 4, lines 12-19}**

(b) introducing aluminum oxide particles and carbon particles into the provided chamber; **{page 5, lines 2-24}**

(c) reacting aluminum oxide particles and carbon particles introduced into the provided chamber with nitrogen, comprising: **{page 5, lines 24-page 6, line 10}**

mixing the aluminum oxide particles and carbon particles within the provided chamber, **{page 5, lines 24-page 6, line 10}**

passing nitrogen gas over the mixing aluminum oxide particles and carbon particles with the chamber; **{page 5, lines 24-page 6, line 10}** and

having the mixing aluminum oxide particles and carbon particles with the nitrogen gas passing over the mixing aluminum oxide particles and carbon particles at a temperature maintained and sufficient to convert the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride during the conversion process. **{page 5, lines 24-page 6, line 10}**

Claim 42. (rejected) The method recited in claim 36 wherein the temperature is in a range of about 1700-1900°C. **{page 5, lines 5-12}**

Claim 43. (rejected) The method recited in claim 41 including removing the aluminum oxynitride from the chamber. **{Page 6, lines 10-12}**

Claim 44. (rejected) The method recited in claim 41 including continuously removing the aluminum oxynitride from the chamber. **{page 7, lines 22-page 8, line 20}**

Claim 45. (rejected) The method recited in claim 43 wherein the temperature is in a range of about 1700-1900°C. **{page 5, lines 5-12}**

Claim 46. (rejected) The method recited in claim 44 wherein the temperature is in a range of about 1700-1900°C. **{page 5, lines 5-12}**

Claim 47. (rejected) A method of making aluminum oxynitride, the method comprising:

(a) providing a chamber; **{page 4, lines 12-19**

(b) continuously introducing aluminum oxide particles and carbon particles into the provided chamber; **{page 5, lines 2-24}; page 7, lines 20-21; page 8, lines 4-20}**

(c) reacting aluminum oxide particles and carbon particles continuously introduced into the provided chamber with nitrogen, **{page 5, lines 24-page 6, line 10}** comprising:

continuously mixing the aluminum oxide particles and carbon particles within the provided chamber; **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}**

passing nitrogen gas over the mixing aluminum oxide particles and carbon particles with the mixing aluminum oxide particles and carbon particles being at a temperature to continuously convert the aluminum oxide particles, carbon particles and nitrogen into the

aluminum oxynitride and wherein said the temperature of the mixing aluminum oxide particles and carbon particles with the nitrogen gas passing over the mixing aluminum oxide particles and carbon particles is maintained during the conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride. **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}**

Claim 48. (rejected) The method recited in claim 47 wherein the temperature is in a range of about 1700-1900°C. **{page 5, lines 5-12}**

Claim 49. (rejected) The method recited in claim 47 including removing the aluminum oxynitride from the chamber. **{Page 6, lines 10-12}**

Claim 50. (rejected) The method recited in claim 47 including continuously removing the aluminum oxynitride from the chamber. **{page 7, lines 22-page 8, line 20}**

Claim 51. (rejected) The method recited in claim 50 wherein the temperature is in a range of about 1700-1900°C. **{page 5, lines 5-12}**

Claim 52. (rejected) The method recited in claim 49 wherein the temperature is in a range of about 1700-1900°C. **{page 5, lines 5-12}**

Claim 53. (rejected) A method of making aluminum oxynitride, the method comprising:

(a) providing a chamber; **{page 4, lines 12-19**

(b) continuously introducing aluminum oxide particles and carbon particles into the provided chamber; **{page 5, lines 2-24}; page 7, lines 20-21; page 8, lines 4-20}**

(c) reacting aluminum oxide particles and carbon particles continuously introduced into the provided chamber with nitrogen, **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}** comprising:

continuously mixing and heating the provided chamber with the aluminum oxide particles and carbon particles within the provided chamber; **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}**

passing nitrogen gas over the mixing aluminum oxide particles and carbon particles; **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}** and

wherein heating of the mixing aluminum oxide particles and carbon particles with the nitrogen gas passing over the mixing aluminum oxide particles and carbon particles being sufficient to convert the aluminum oxide particles, carbon particles and nitrogen into aluminum oxynitride to convert the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride and wherein the temperature of the mixing aluminum oxide particles and carbon particles with the nitrogen gas passing over the mixing aluminum oxide particles and carbon particles is maintained during the conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride. **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}**

Claim 54. (rejected) A method of making aluminum oxynitride, the method comprising:

(a) providing a chamber; **{page 4, lines 12-19}**

(b) continuously introducing aluminum oxide particles and carbon particles into the provided chamber; **{page 5, lines 2-24; page 7, lines 20-21; page 8, lines 4-20}**

(c) reacting aluminum oxide particles and carbon particles continuously introduced into the provided chamber with nitrogen, comprising:

heating the provided chamber; **{page 5, lines 24-page 6, line 1;, page 7, lines 20-21; page 8, lines 4-20}**

continuously mixing the aluminum oxide particles and carbon particles within the provided chamber; **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}**

passing nitrogen gas over the mixing aluminum oxide particles and carbon particles**{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}**; and

including heating of the mixing aluminum oxide particles and carbon particles with the nitrogen gas passing over the mixing aluminum oxide particles and carbon particles to continuously convert the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride and wherein the temperature of the mixing aluminum oxide particles and

carbon particles with the nitrogen gas passing over the mixing aluminum oxide particles and carbon particles sufficient to convert the aluminum oxide particles, carbon particles and nitrogen into aluminum oxynitride during the conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride. **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}**

Claim 55. (rejected) The method recited in claim 54 wherein the mixing comprises rotating the chamber.**{page 5, line 30-page 6, line 5}**

Claim 56. (rejected) The method recited in claim 54 wherein the heating is at a temperature of about 1700°C or higher. **{page 5, lines 5-12}**

Claim 57. (rejected) The method recited in claim 56 wherein the mixing comprises rotating the chamber. **{page 5, line 30-page 6, line 5}**

Claim 58. (rejected) A method of making aluminum oxynitride, the method comprising:

(a) introducing aluminum oxide particles and carbon particles into a chamber; **{page 5 lines 2-24}** and

(b) mixing the aluminum oxide particles and carbon particles within the chamber while passing nitrogen gas over the aluminum oxide particles and carbon particles during the mixing with the temperature of the mixing aluminum oxide particles and carbon particles with the nitrogen gas passing over the mixing aluminum oxide particles and carbon particles being sufficient to convert the aluminum oxide particles, carbon particles and nitrogen into aluminum oxynitride during conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride. **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}**

Claim 59. (rejected) The method recited in claim 58 wherein the temperature is in a range of about 1700-1900 ºC. **{page 5, lines 5-12}**

Claim 60. (rejected) A process for making aluminum oxynitride comprising:

(a) providing a chamber, **{page 4, lines 12-19**

(b) introducing aluminum oxide particles and carbon particles into the chamber, **{page 5 lines 2-24}**

(c) mixing the aluminum oxide particles and carbon particles while passing nitrogen gas thereover at a temperature sufficient to form the aluminum oxynitride, **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}** and

(d) removing said aluminum oxynitride from the chamber. **{Page 6, lines 10-12}**

Claim 61. (rejected) The process recited in claim 60 wherein the temperature is within a range of about 1700-1900 °C. **{page 5, lines 5-12}**

Claim 62. (rejected) The process recited in claim 60 wherein the temperature is held substantially constant. **{page 6, line 5-8}**

Claim 63. (rejected) The process recited in claim 62 wherein the temperature is within a range of about 1700-1900 °C. **{page 5, lines 5-12}**

Claim 64. (rejected) The process recited in claim 60 wherein the aluminum oxide particles and carbon particles are introduced continuously while said aluminum oxynitride is removed continuously. **{page 7, lines 22-page 8 line 20}**

Claim 65. (rejected) The process recited in claim 64 wherein the temperature is within a range of about 1700-1900 °C. **{page 5, lines 5-12}**

Claim 66. (rejected) The process recited in claim 64 wherein the temperature is held substantially constant. **{page 6, line 5-8}**

Claim 67. (rejected) The process recited in claim 66 wherein the temperature is within a range of about 1700-1900 °C. **{page 5, lines 5-12}**

Claim 76. (rejected) A method of making aluminum oxynitride, the method comprising:

(a) introducing aluminum oxide particles and carbon particles into a chamber; and **{page 5, lines 2-24}**

(b) mixing the aluminum oxide particles and carbon particles within the chamber while passing nitrogen gas over the aluminum oxide particles and carbon particles during the mixing with the temperature of the aluminum oxide particles and carbon particles with the nitrogen gas passing over the mixing aluminum oxide particles and carbon particles being sufficient to convert the aluminum oxide particles, carbon particles and nitrogen into

aluminum oxynitride during the conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride. **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}**

Claim 77. (rejected) The process recited in claim 76 wherein the temperature is within a range of about 1700-1900 ºC during the conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride. **{page 5, lines 5-12}**

Claim 78. (rejected) The process recited in claim 76 wherein the temperature is held substantially constant during the conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride. **{page 6; line 5-8}**

Claim 79. (rejected) The process recited in claim 78 wherein the temperature is within a range of about 1700-1900 ºC during the conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride. **{page 5, lines 5-12}**

Claim 80. (rejected) The process recited in claim 76 wherein the aluminum oxide particles and carbon particles are introduced continuously while said aluminum oxynitride is removed continuously. **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20, page 7, lines 22-page 8, line 20}**

Claim 81. (rejected) The process recited in claim 80 wherein the temperature is within a range of about 1700-1900 °C during the conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride. **{page 5, lines 5-12}**

Claim 82. (rejected) The process recited in claim 80 wherein the temperature is held substantially constant during the conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride. **{page 6; line 5-8}**

Claim 83. (rejected) The process recited in claim 82 wherein the temperature is within a range of about 1700-1900 °C during the conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride. **{page 5, lines 5-12}**

Claim 84. (rejected) The method of claim 32 , wherein the mixing comprises rotating the chamber.

Claim 85. (rejected) The method of claim 84, further comprising:

forming the aluminum oxynitride into a transparent structure. **{page 10, lines 23-26}**

Claim 86. (rejected) The method of claim 85, wherein forming the aluminum oxynitride comprises:

forming a green body comprising the aluminum oxynitride; and

sintering the green body. **{page 9, line 28-page 10, line 16}**

Claim 87. (rejected) The method of claim 86, further comprising: isostatically pressing the sintered green body under heat. **{page 10, lines 16-22}**

Claim 88. (rejected) The method of claim 32, wherein the aluminum oxynitride comprises $Al_{23-1/3x}O_{27+x}N_{5-x}$, where $0.429 \leq x \leq 2$. **{page 1, lines 5-6}**

Claim 89. (rejected) A method of making aluminum oxynitride, the method comprising:

(a) introducing aluminum oxide particles and carbon particles into a chamber; **{page 5 lines 2-24}**

(b) mixing the aluminum oxide particles and the carbon particles in the chamber to provide a reaction mixture; **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}**

(c) heating the mixing reaction mixture at a temperature of between 1700°C and 1900°C for between 10 minutes and 30 minutes while nitrogen gas flows over the mixing reaction mixture to convert the aluminum oxide particles, carbon particles, and nitrogen to aluminum oxynitride; **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}** and

(d) removing the aluminum oxynitride from the chamber. **{Page 6, lines 10-12}**

Claim 90. (rejected) The method of claim 89, wherein the mixing reaction mixture provided in step (b) has an initial temperature, the method further comprising heating the mixing reaction mixture to raise the initial

temperature from the initial temperature to the constant temperature. **{page 5, line 30-page 6, line 12}**

Claim 91. (rejected) The method recited in claim 90 wherein the temperature is ramped from the initial temperature to the constant temperature. **{page 6, lines 5-7}**

Claim 92. (rejected) The method recited in claim 91 wherein the ramp rate is at least 10 degrees C per minute. **{page 6, lines 5-7}**

Claim 93 (rejected) A method of making aluminum oxynitride, the method comprising:

(a) introducing aluminum oxide particles and carbon particles continuously into a chamber; **{page 5, lines 2-24}**

(b) continuously rotating the chamber to continuously mix the aluminum oxide particles and carbon particles within the chamber while passing nitrogen gas over the aluminum oxide particles and carbon particles during the mixing with the temperature of the aluminum oxide particles and carbon particles with the nitrogen gas passing over the mixing aluminum oxide particles and carbon particles being within a range of about 1700-1900

ºC and holding the temperature constant during conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride; **{page 5, lines 24-page 6, line 10; page 7, lines 20-21}** and

removing the aluminum oxynitride continuously from the chamber. **{page 5, lines 24-page 6, line 10; page 7, lines 20-21; page 8, lines 4-20}**